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**THE HARRY E. SOVEREIGN COLLECTION OF
NORTHWEST PACIFIC DIATOMS**

By

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ABSTRACT: The Harry E. Sovereign collection, now at the California Academy of Sciences, is a significant contribution to the knowledge of the recent and fossil diatoms of the Pacific Northwest. The extensive collection, the work of over 30 years, represents a wide variety of sampling environments and is especially rich in freshwater forms. It contains important historical data concerning the conditions of lakes before the impact of current populations, making the collection invaluable to future investigations of the lakes of Washington State and adjacent areas.

INTRODUCTION

Harry E. Sovereign was born in Denver, Colorado, in 1884. After graduation from the University of Colorado, in 1908, he began his professional career as a civil engineer for the firm of Field, Fellow and Hinderlider. From 1911 to 1915 he worked for the Wilcox Canal Company on the construction of a dam near Bear Lake in Idaho. For the following fifteen years he was employed by the American Metals Company in the development of silver mines in Mexico. In 1927 Mr. Sovereign and his wife, Ruby, moved to Seattle, Washington, where he worked for the Henry W. Beecher Company on naval engineering projects until his retirement in 1953. Mr. Sovereign's interest in diatoms began shortly after his arrival in Seattle. He notes that Professor Trevor Kincaid, University of Washington, furnished him with his first collections of Pacific Northwest diatoms. With this incentive, Sovereign pursued his research and field collecting on an active basis until approximately 1963. In honor of Professor Kincaid, he named a new species of diatoms, *Navicula Kincaidii*, published in the *Proceedings of the California Academy of Sciences* (1963).

During the last few years of his life Mr.

Sovereign was ably assisted by Mrs. Sovereign, especially in the preparation of an unpublished paper, "The diatoms of Ohanapeosh Hot Springs." Harry E. Sovereign died in Seattle on April 15, 1965, and his wife died in May of the same year. As a bequest of the Sovereign estate, the complete collection including his diatom library and microscope was given to the California Academy of Sciences where it is now a part of the diatom collection in the Department of Geology.

Sovereign's extensive correspondence with Friedrich Hustedt, the well known German authority on diatoms, is preserved as an integral part of the collection.

Although he published only two papers, the taxonomic and environmental value of his collection has prompted the writing of this paper.

DESCRIPTION OF THE COLLECTION

The collection may be divided into three general areas of interest to the reader. The first and most important is composed of recent flora of the lakes, streams, and creeks of the State of Washington. Sovereign emphasized population variations related to environmental differences created by the Cascade Range as it divides the

State of Washington. He collected 452 samples from Washington and the neighboring states in support of his efforts to confirm the population variations. He divided the state by geographic and environmental boundaries into five study areas: 1) Eastern Washington, including Stevens, Pend d'Oreille, Spokane, Whitman, and Garfield counties; 2) Central Washington, including Okanagan, Ferry, Lincoln, Adams, Franklin, Walla Walla, Benton, Yakima, Kittitas, Grant, Douglas, and Chelan counties; 3) Mount Rainier National Park; 4) Western Washington, including Whatcom, Skagit, Snohomish, King, Pierce, Thurston, Pacific, Lewis, Cowlitz, and Skamania counties; 5) The Olympic Peninsula including Clallam, Grays Harbor, and Mason counties.

With the exception of Ferry, Garfield, Benton, and Wahkiakam counties, samples were collected from representative lakes, streams, creeks, and occasional snow rills. Sovereign's attention to detail and numerous field notes has allowed us to establish township and range or longitude and latitude for most samples.

The second area of interest is fossil communities from both Washington and Oregon. Some of the sample locations have since been inundated by subsequent formation of lakes. The fossil samples are located by township and range as well as field sample numbers.

The third area of interest encompasses a wide range of locations and environments including recent, fossil, freshwater, and marine diatoms. The samples include specimens from Manila Bay, Philippine Islands, Colorado, California, and Alaska.

The collection proper consists of seven units: (1) a catalog of the collection, (2) a species list, (3) approximately 1400 strew mounts, (4) about 600 vials of cleaned and preserved material, (5) a card index of the collection, (6) field notebooks, (7) and an unpublished manuscript, "The diatoms of Ohanapecoh Hot Springs."

The catalog is a single volume in which samples are listed in chronological order and assigned consecutive numbers from 1 to 548. These numbers appear on all subsequent references to a particular sample. The number is followed by a description of the location, date of sampling, initials of the collector, pH, alkalinity, elevation, and important environmental data.

The species list is a series of notebooks containing lists of species for each sample prepared by Sovereign. The list contains the microscope

coordinates for the location of each species on the corresponding numbered slide. In addition, the list commonly includes the reference to original literature for the species, with occasional drawings of definitive structures and morphological measurements.

The third unit is a set of cleared, strewn, hyrax mounts of these prepared samples. The slides are numbered according to the catalog entry. In several cases more than one slide for a particular sample was prepared. For example, slides prepared from sample 234 have 234 on the slide label and the first slide is 234-1, the second 234-2, etc. These numbers appear on the species list to indicate which slide was used.

In the card index samples are cross-indexed by species, general location and specific area, such as Mount Rainier or Crater Lake. In all three categories the samples are indexed by catalog numbers. Each species card contains the slide numbers on which the species was identified.

Sovereign's field notes are found in several of the volumes or transposed to volumes of specific date; e.g., notes concerning pH are found in a single volume.

To facilitate the use of this collection, I have prepared a summary, arranged chronologically and cross-indexed by geographical names. It contains a common number that refers to sample, location and slide. The summary also includes township and range, or longitude and latitude, description of location, county and/or state, date of collection, pH and species lists. This summary is on file with the Sovereign collection.

ACKNOWLEDGMENTS

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SPECIES AND LOCALITIES LIST FROM SLIDES PREPARED BY FRIEDRICH HUSTEDT
IN THE H. E. SOVEREIGN COLLECTION

| Species | Location | Hustedt slide No. |
|--|--|-------------------------|
| <i>Achnanthes brevipes</i> Agardh | Kolberg, Salzwiesen 2 | 21 |
| <i>Achnanthes courc tata</i> Brébisson | Zittau Granitwand Kr. 1581-2 | 54 |
| <i>Achnanthes grimmei</i> Krasske | Kleinern bei Wildungen 28.8.29.H | 56 |
| <i>Achnanthes hungarica</i> Grunow | Klinkerteich, Plön | 14 |
| <i>Achnanthes kryophila</i> Boye Peterson | Abisko 186 Quellgebiet | 57 |
| <i>Achnanthes lapponica</i> Hustedt | Abisko 186 Quellgebiet | 57 |
| <i>Achnanthes linearis</i> (Wm. Smith) Grunow | Abisko 186 Quellgebiet | 57 |
| <i>Achnanthes marginulata</i> Grunow | Lappland 189 Abisko, Tümpel | 58 |
| <i>Achnanthes minutissima</i> Kützing | Sumatra. SK 1c Singkaraksee | 62 |
| <i>Achnanthes minutissima</i> Kützing | Abisko 186 Quellgebiet | 57 |
| <i>Achnanthes pyrenaica</i> Hustedt | Gr. Wasserfall, Moos. 7 | 55 |
| <i>Achnanthes inflata</i> Kützing | Neuseeland | 59 |
| <i>Achnanthes trinodis</i> Arnott | Lunz Nieder-Österreich | 53 |
| <i>Amphora coffeaeformis</i> Agardh | Tepl-Bett, Karlsbad | 25 |
| <i>Amphora coffeaeformis</i> Agardh | Kolberg, Salzwiesen 2 | 21 |
| <i>Anomoeoneis styriaca</i> (Grunow) Hustedt | Abisko 157 3 Teich a Bahndamm | 66 |
| <i>Anomoeoneis zellensis</i> (Grunow) Cleve | Abisko 157 3 Teich a Bahndamm | 66 |
| <i>Caloneis clevei</i> Grunow | Schaalsee, Kirchene Moos. 1 | 91 |
| <i>Caloneis ladogensis</i> (Cleve) Hustedt var. <i>densestriata</i> Hustedt | Wollingster Sea 1937 | 24 |
| <i>Caloneis obtusa</i> (Wm. Smith) Cleve | Abisko, Lappland 157 Teich | 38 |
| <i>Cocconeis disculus</i> (Schumann) Cleve | Domblitten | 29 |
| <i>Cyclotella distinguenda</i> Hustedt | Lunz Nieder-Österreich | 53 |
| <i>Cyclotella elgeri</i> Hustedt | Siskiyou County, California | 94 |
| <i>Cyclotella iris</i> Brun | Auzillac Frankreich | 51 |
| <i>Cyclotella stelligera</i> Cleve & Grunow | Gemündener Maar, Grund | 52 |
| <i>Cymbella alpina</i> Grunow | Pyrenäen: Lac d'Artouste Quell-sumpf | 65 |
| <i>Cymbella aspera</i> (Ehrenberg) Cleve | Kitzbühel, Tirol | 32 |
| <i>Cymbella bernensis</i> Meister | Bei den Jffigenbachfällen Schweiz | 63 |
| <i>Cymbella botellus</i> Lagerstedt | Spitzbergen Gletscher-Abfluss Moos | 60 |
| <i>Cymbella cistula</i> var. <i>arctica</i> Lagerstedt | Spitzbergen Gletscher-Abfluss Moos | 60 |
| <i>Cymbella gracilis</i> (Rabenhorst) Cleve | Java, DIC, Dieng Plateau, Telaga Merdodo | 43 |
| <i>Cymbella hebridica</i> (Gregory) Grunow | Riesengebirge Kl. Schnee-grube | 64 |
| <i>Cymbella lapponica</i> Grunow | Abisko 186 Quellgebiet | 68 |
| <i>Cymbella norvegica</i> Grunow | Abisko 157 3 Teich a Bahndamm | 66 |
| <i>Cymbella ruttneri</i> Hustedt | Java, D 3a Dieng Plateau, Telaga Perigelon | 67 |
| <i>Cymbella sumatrensis</i> Hustedt | Sumatra SK 1c Singkaraksee | 62 |
| <i>Cymbella turgidula</i> Grunow | Holzmaar an Ceratophyllum | 61 |
| <i>Diatomella balfouriana</i> Greville | Pass Thurn, 6 an Dicranella an Felsen Tirol | 35 |
| <i>Denticula tenuis</i> Kützing | Pyrenäen Lac d'Artouste, Quell-sumpf 18.b. | 44 |

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| <i>Denticula vanheurcki</i> Brun | Java, DIC Dieng Plateau, Telaga Merdodo | 43 |
| <i>Diploneis domblittensis</i> (Grunow) Cleve | Domblitten | 29 |
| <i>Diploneis domblittensis</i> var. <i>subcontracta</i> A. Cleve | Nieder-Österreich, Lunz Untersee Stat. II | 28 |
| <i>Diploneis elliptica</i> (Kützing) Cleve | Nieder-Österreich, Lunz Untersee V 11m | 22 |
| <i>Diploneis marginestriata</i> Hustedt | Nieder-Österreich, Lunz Untersee V 12m | 31 |
| <i>Diploneis mauleri</i> (Brun) Cleve | Domblitten | 29 |
| <i>Diploneis ovalis</i> (Hilse) Cleve | Kitzbühel, Tirol | 32 |
| <i>Diploneis pulcherrima</i> Hustedt | Java TJ 2 IIIc Tjibeureum Wasserfall | 27 |
| <i>Epithemia sorex</i> var. <i>lapponica</i> Hustedt | Abisko 157. Teich | 38 |
| <i>Epithemia turgida</i> (Ehrenberg) Kützing | Jimmerather Maar 1,5m | 41 |
| <i>Eunotia arcus</i> Ehrenberg | Pyrenäen: Lac d'Artouste Quell-sumpf | 65 |
| <i>Eunotia bigibba</i> Kützing | Eisenach, Drachenschlucht | 37 |
| <i>Eunotia clevei</i> Grunow | Setanai, Japan | 40 |
| <i>Eunotia denticulata</i> (Brébisson) Rabenhorst | Abisko, Lappland, Tümpel | 39 |
| <i>Eunotia lapponica</i> Grunow | Abisko, Lappland, Tümpel | 39 |
| <i>Eunotia serpentina</i> Ehrenberg | Neuseeland | 59 |
| <i>Eunotia triodon</i> Ehrenberg | Abisko, Lappland, Tümpel | 39 |
| <i>Fragilaria capucina</i> Desmazieres | Wollin Plankton | 5 |
| <i>Fragilaria crotonensis</i> (Edwards) Kitton | Behler See | 18 |
| <i>Fragilaria javanica</i> Hustedt | Sumatra, F.H. 2c Harau-Kloof Wasserfall | 45 |
| <i>Gomphocymbella ancylis</i> (Cleve) Hustedt | Nieder Österreich Lunz Untersee Stat. II | 28 |
| <i>Gomphonema cantalicum</i> Brun & Heribaud | Auzillac Frankreich | 51 |
| <i>Gomphonema ericense</i> Grunow | Hainan | 49 |
| <i>Gomphonema quadripunctatum</i> (Østrup) Wislauch | Baikal See Jilischke | 50 |
| <i>Gomphonema subtile</i> Ehrenberg | Java D 3a, Dieng Plateau Telaga Pengilon | 67 |
| <i>Gomphonema transilvanicum</i> Pantocsek | Quelle bei St. Naum, Südslavien 2.b | 6 |
| <i>Gomphonema ventricosum</i> | Lunz Mittersee-Abfluss | 48 |
| <i>Melosira arenaria</i> Moore | Quelle bei St. Naum, Südslavien | 9 |
| <i>Melosira arenaria</i> Moore | Eisenach 6233 | 70 |
| <i>Melosira arenaria</i> Moore | Tirol 3475 | 71 |
| <i>Melosira arenaria</i> Moore | Tirol 3480 | 72 |
| <i>Melosira arenaria</i> Moore | Tirol 3480 | 73 |
| <i>Melosira arenaria</i> Moore | Eisenach 6233 | 74 |
| <i>Melosira arenaria</i> Moore | Eisenach 6233 | 75 |
| <i>Melosira arenaria</i> Moore | St. Naum 735 | 76 |
| <i>Melosira arenaria</i> Moore | Wilhelmshöhe bei Kassel 3790 | 77 |
| <i>Melosira arenaria</i> Moore | Eisenach 6232 | 78 |
| <i>Melosira arenaria</i> Moore | St. Naum 735 | 79 |
| <i>Melosira arenaria</i> Moore | Wilhelmshöhe bei Kassel 3790 | 80 |
| <i>Melosira arenaria</i> Moore | Tirol 3475 | 81 |
| <i>Melosira rutneri</i> Hustedt | Java TJ2 IIIc Tjibeureum Wasserfall | 27 |
| <i>Navicula accommoda</i> Hustedt | Hemmental, Bach. Schaffhausen Schweiz | 93 |
| <i>Navicula accommoda</i> Hustedt | Hemmental, Bach. Schaffhausen Schweiz | 89 |
| <i>Navicula grimmei</i> Krasske | Belg-Kongo. 529 May-ia Moto | 15 |
| <i>Navicula grimmei</i> Krasske | Kleinern bei Wildungen | 56 |
| <i>Navicula jakovljevic</i> Hustedt | Quelle bei St. Naum, Südslavien 2.b | 6 |

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| <i>Navicula ludloviana</i> A. Schmidt | Fort Ludlow, Washington | 12 |
| <i>Navicula perpusilla</i> Grunow | Pass Thurn 6 an Dicranella an Felsen, Tirol | 35 |
| <i>Navicula placentula</i> Ehrenberg | Nieder-Österreich Lunz, Untersee V 11m | 22 |
| <i>Navicula pseudobryophila</i> Hustedt | Lappland 189 Abisko, Tümpel | 58 |
| <i>Navicula tenuicephala</i> Hustedt | Lappland 189 Abisko, Tümpel | 58 |
| <i>Neidium distinctepunctatum</i> Hustedt | Nieder-Österreich Lunz, Untersee V 11m | 22 |
| <i>Neidium hitchcocki</i> (Ehrenberg) Cleve | Vätter-See 32 13m 17.8.26 Schweden | 3 |
| <i>Neidium meisteri</i> Hustedt | Obere Kelle Gornergrat | 26 |
| <i>Peronia heribaudi</i> Brun & Peragallo | Riesengibirge Grosser Koppenteich 3557 | 47 |
| <i>Pinnularia balfouriana</i> Grunow | Pass Thurn 6 an Dicranella an Felsen Tirol | 35 |
| <i>Pinnularia gracillima</i> Gregory | Java, DIC Dieng Plateau, Telaga Merdodo | 43 |
| <i>Pinnularia polyonca</i> (Brébisson) | Sumatra, FH 3D, Harau Kloof, Überra. | 36 |
| O. Müller | Wand | |
| <i>Pinnularia pulchra</i> Østrup | Abisko 180 Schmelzwässer See | 33 |
| <i>Pinnularia semicruciat</i> (A. Schmidt) | Vätter-see 32 13m 17.8.26 Schweden | 3 |
| A. Cleve | | |
| <i>Pinnularia transversa</i> (A. Schmidt) | Sodankylä a | 34 |
| <i>Synedra capitata</i> Ehrenberg | Jmmerrather Maar 1, 5m | 41 |
| <i>Stephanodiscus alpinus</i> Hustedt & Ruttner | R.S. Grundlsee Pl 5m 6.5 35 | 10 |
| <i>Stephanodiscus astraea</i> Ehrenberg | Trentsee | 7 |
| <i>Stephanodiscus carconensis</i> Grunow | Pit River, Oregon | 2 |
| <i>Stephanodiscus damasi</i> Hustedt | Belg-Kongo 182 Edwardsee Pl. | 1 |
| <i>Stephanodiscus dubius</i> (Fricke) Hustedt | Wollin Plankton | 5 |
| <i>Stephanodiscus hantzschia</i> Grunow | Klinkerteich, Plön | 14 |
| <i>Stephanodiscus lucens</i> Hustedt | Ems. bei Hilkenborg 464 | 8 |
| <i>Stauroneis lauenburgiana</i> Hustedt | Kührener Au Holstein 257 | 20 |
| <i>Stauroneis montana</i> Krasske | Hasbruch Jagdhutte, Bach. Lebermoos | 83 |
| <i>Stauroneis montana</i> f. <i>lanceolata</i> Hustedt | Hasbruch, Wasserrinne, Moos 2 | 84 |
| <i>Stauroneis montana</i> f. <i>lanceolata</i> Hustedt | Hasbruch, Wasserrinne, Moos 1 | 82 |
| <i>Stephanodiscus niagarae</i> Ehrenberg | Jsabot, Guatemala | 19 |
| <i>Stephanodiscus niagarae</i> Ehrenberg | Eriesee, U.S.A. | 11 |
| <i>Stephanodiscus novaezeelandiae</i> Cleve | Kingsland, Neuseeland | 16 |
| <i>Stephanodiscus tenuis</i> Hustedt | Ems, bei Papenburg 197 | 4 |
| <i>Surirella amoena</i> Pantocsek | Wehr bei Burgebrohl, Rheinland oberer Teil d. Lagers | 88 |
| <i>Surirella engleri</i> O. Müller | Belg-Kongo 134 Eduard-See Pl Obfl | 17 |
| <i>Surirella contorta</i> Kitton | Taca Puna Neuseeland | 30 |
| <i>Surirella obscura</i> Reich | Puebla, Mexico | 90 |
| <i>Surirella skvortzowi</i> Hustedt | Baikalsee | 23 |
| <i>Surirella sovireigni</i> Hustedt | Shadow Lake, King Co. Washington | 92 |
| <i>Surirella spinosa</i> Hustedt | Java TJ 2 IIIc, Tjibeureum Wasserfall | 27 |
| <i>Surirella spiralis</i> Kützing | Lunzer See | 85 |
| <i>Tabellaria binalis</i> (Ehrenberg) Grunow | Silbersee 10.8.36 | 42 |
| <i>Tabellaria fenestrata</i> var. <i>asterionelloides</i> Grunow | Viersee 26.8.17 | 13 |
| <i>Tetracyclus rupestris</i> (A.Brébisson) Grunow | Bayrische Alpen Gfallermühlen 4 Moos +600m | 46 |